

# Fragility and contagiousness of the total laryngectomy patient in the COVID-19 pandemic

## *Peculiarità (fragilità e contagiosità) del paziente con laringectomia totale nella pandemia da COVID-19*

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### SUMMARY

**Objective.** The Coronavirus disease 2019 (COVID-19) pandemic has posed significant problems for patients who have undergone total laryngectomy (TL). The lack of specific guidelines and paucity of information available to the public on this topic has clearly emerged during the ongoing pandemic. The aim of the present study is to investigate our personal experience in managing the stoma in TL patients during the COVID-19 pandemic. **Methods.** A questionnaire was administered by phone to laryngectomised patients who had previously been seen at the outpatient otolaryngology clinics of Vittorio Veneto and Barletta Hospitals from January to December 2020.

**Results.** A total of 92 patients were included. Twenty-five patients (27%) had been tested for SARS-CoV-2. Among these, 19 (76%) had been investigated with a nasal swab, 5 (20%) with a tracheal swab and 1 with a serological assay. Five patients were positive for SARS-CoV-2 (in 4 cases as a result of the nasal swab, in one case with the bronchial aspirate). Eighty-four patients (91%) used a heat moisture exchanger over the stoma every day, but 6 patients (6.5%) were unaware of the importance of protecting the stoma.

**Conclusions.** We conclude that TL patients should always be adequately informed by healthcare staff about how to manage their stoma. Specific guidelines are needed for testing TL patients for SARS-CoV-2.

**KEY WORDS:** COVID-19, SARS-CoV-2, otolaryngology, laryngectomy, larynx

### RIASSUNTO

**Obiettivi.** La pandemia da COVID-19 (COVID-19) ha posto alcuni problemi significativi ai pazienti sottoposti a laringectomia totale (TL). La mancanza di linee guida specifiche e la scarsità di informazioni a disposizione del pubblico su questo argomento sono chiaramente emerse durante la pandemia in corso. Lo scopo del presente studio è stato quello di indagare l'esperienza personale dei nostri pazienti sottoposti a TL nella gestione della loro stomia durante la pandemia da COVID-19.

**Metodi.** Un questionario è stato somministrato telefonicamente ai pazienti laringectomizzati che erano stati precedentemente visitati presso gli ambulatori otorinolaringoiatrici degli ospedali di Vittorio Veneto e Barletta da gennaio a dicembre 2020.

**Risultati.** L'indagine ha riguardato in tutto 92 pazienti. Venticinque pazienti (27%) erano stati testati per COVID-19. Tra questi, 19 (76%) erano stati studiati con tampone nasale, 5 (20%) con un tampone tracheale e 1 con un test sierologico. Cinque pazienti sono risultati positivi al COVID-19 (con tampone nasale in 4 casi, su aspirato bronchiale in 1). Ottantaquattro pazienti (91%) utilizzavano ogni giorno un filtro scambiatore di calore e umidità al davanti dello stoma, mentre 6 pazienti (6,5%) non erano consapevoli dell'importanza di proteggere lo stoma.

**Conclusioni.** In conclusione, si può affermare che i pazienti con TL dovrebbero sempre essere adeguatamente informati dal personale sanitario su come gestire la propria stomia. Sono necessarie linee guida specifiche per testare i pazienti TL durante la pandemia da COVID-19.

**PAROLE CHIAVE:** COVID-19, SARS-CoV-2, otorinolaringoiatria, laringectomia, laringe

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## Introduction

Early in 2020, the World Health Organization described a new coronavirus related severe acute respiratory syndrome caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) <sup>1</sup>. The pathogenetic agent is a coronavirus, and the disease it causes, Coronavirus disease 2019 (COVID-19) – first reported in Wuhan (Hubei Province, China) in December 2019 – spread rapidly across the globe <sup>2,3</sup>. Italy was the first European country to have documented cases, and by May 1<sup>st</sup>, 2020, it already had 204,576 confirmed cases and 26,049 deaths according to the Istituto Superiore di Sanità <sup>4</sup>. To contain the viral contagion, the Italian government adopted extraordinary measures that culminated on March 9<sup>th</sup>, 2020 with a nationwide lockdown to restrict people's movements.

The most common initial symptoms of COVID-19 infection were cough, fever, fatigue, increased mucus production, dyspnoea, sore throat and myalgia <sup>5</sup>. People who had undergone total laryngectomy (TL) were considered at higher risk of poor outcomes in the event of contracting COVID-19 because of their history of cancer and likely medical comorbidities. Such patients commonly have chronic lung disease, peripheral vascular disease, cardiac disease, cerebrovascular disease, diabetes and a propensity for atelectasis due to loss of upper airway resistance <sup>6</sup>. Further aggravating factors might include a history of smoking, and impaired mucociliary function due to inhalation of cold, dry air through the stoma <sup>7</sup>.

The COVID-19 pandemic has brought to light the lack of specific guidelines and paucity of information available regarding people who have undergone TL. We found that numerous patients arrived at our outpatient's clinic wearing face masks but insufficient protection over their tracheostomy. Several reported having been submitted to nasal swabs because tracheal swabs were not envisaged by COVID-19 diagnostic protocols at the time. Some patients also complained of the difficulties and/or delays they experienced in accessing hospital facilities.

The aim of the present study was to investigate our TL patients' personal experience with managing their stoma during the COVID-19 pandemic.

## Methods

From January to December 2020, 129 people who had undergone TL in previous years at institutions of Vittorio Veneto Hospital – Center for Laryngeal Cancer Diagnosis and Treatment in the Veneto region of north-east Italy, and UOC Otorhinolaryngology Head and Neck Surgery – Ospedale Mons. R. Dimiccoli of Barletta, came to our outpatient clinics for follow-up and to check their voice prosthe-

sis, or replace it in the event of a malfunction. Sixty-five of these patients came from other Italian regions. Ninety-two (81 males and 11 females; mean age  $69.2 \pm 9.7$  years, median 71 years, range 47-88 years) agreed to answer the questionnaire shown in Table I and were included in the present investigation. The questionnaire was administered by phone by the same otolaryngologists (ML and VdR) to all participants, whose answers were recorded anonymously.

## Results

### COVID-19 tests

Twenty-five of the 92 patients (27%) had been tested for SARS-CoV-2. The reasons for testing were due to specific symptoms in 9 cases; to close contact with people who had tested positive in 7 cases; because they had to start chemotherapy in 3 cases; 2 patients were scheduled to be hospitalised for cardiological treatment; 1 had to be tested before resuming work; and the remaining 3 underwent testing by their own initiative. Nineteen patients (76%) had been tested with a nasal swab, 5 (20%) with a tracheal swab (1 of these 5 patients had both a nasal and a tracheal swab) and 1 had undergone a serological test (before returning to work). Five patients (20%) tested positive for SARS-CoV-2. A

**Table I.** COVID-19 questionnaire for TL patients.

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1. How long do you generally use a heat moisture exchanger (HME)?
    - a. < 3 hours a day
    - b. 3-6 hours a day
    - c. > 6 hours a day
  2. Have you had a positive test for SARS-CoV-2?
  3. What kind of test did you have?
    - a. Nasal/tracheal rapid antigen detection test
    - b. Nasal/tracheal molecular test
    - c. Serological test
  4. Would it bother you to get a swab on your tracheostoma?
  5. Have you been in close contact with people who tested positive for SARS-CoV-2?
    - a. If so, did you use any kind of airway protection?
  6. Do you wear a face mask outside the home?
  7. Are you aware or have you been told that you need to protect your tracheostoma?
  8. Have you had flu symptoms since the beginning of the COVID-19 pandemic?
  9. Do you consider yourself at higher risk of contracting COVID-19 than non-TL people?
  10. Have you been advised to take more precautions than non-TL people?
  11. Have you encountered difficulties or delays in accessing the hospital during the COVID-19 pandemic?
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nasal swab was positive in 4 cases (three complained of symptoms). The fifth patient, a 77-year-old male, had a negative nasal swab but was hospitalised with severe symptoms compatible with COVID-19, and the virus was detected on bronchial aspirates. The patient received appropriate treatment and recovered after two weeks.

*Personal experiences of TL patients*

When asked about their personal experience of COVID-19 testing, 88 patients answered that they would agree to a tracheal swab, while 4 said they would refuse it. Seven patients reported having been in close contact with people who tested positive for the virus while they were wearing their heat moisture exchanger (HME). None subsequently tested positive for SARS-CoV-2 (on nasal swabs in 2 cases, and both a nasal and a tracheal swab in one).

Eight patients complained of flu symptoms starting in February 2020, with fever in all cases, and cough in 6. Four of the latter had a positive swab, and one was hospitalised for COVID-19.

Concerning their personal habits, 84 patients (91%) reported using a conventional HME daily, while 4 used a specific antivirus filter. Five patients used the HME (or antivirus filter) for less than 3 hours a day, 10 used it for 3 to 6 hours a day and 72 used it for more than 6 hours a day. All patients reported wearing face masks. Ninety patients used a form of protection for their stoma (the HME in 84 cases, while 6 patients who found the HME uncomfortable used a scarf). Two patients said they did not usually protect the stoma. All but 6 patients were aware of the importance of protecting the stoma.

Forty-eight patients were advised to take greater precautions

because of their TL, and another 3 because they were receiving chemotherapy. Thirteen patients (14%) reported feeling at higher risk of contracting COVID-19 due to their laryngectomised condition. All had been advised by family members to take particular care. One of these patients reported specific symptoms, but tested negative on both nasal and tracheal swab.

When asked about their experiences of accessing hospital facilities during the pandemic, 12 (13%) patients complained about delays, which were always due to difficulties with arranging transport to the hospital.

**Discussion**

The COVID-19 pandemic has posed some significant problems for TL patients related not only to their higher risk of contagion <sup>6,7</sup>, but also to the lack of specific guidelines on the management of their stoma and the difficulty of reaching hospital facilities during periods of lockdown (Tab. II).

Nasopharyngeal swab is acknowledged as the gold standard for testing people for SARS-CoV-2 infection <sup>8</sup>. The best approach for testing laryngectomised patients for the virus is a matter of debate, however. These patients have no significant airflow through the nasal cavity and nasopharynx, making a nasopharyngeal swab seem nonsensical. That said, it has been demonstrated that TL patients can still develop sinonasal disease <sup>9</sup>. Loss of the nose’s filtering function also raises the risk of inhaling pathogens and developing respiratory infections <sup>10</sup>.

In our sample of TL patients, 25 were tested for SARS-CoV-2, but a tracheal swab was only used for 5 (20%), while only

**Table II.** Total laryngectomy patients in COVID-19 pandemic. Fragilities and contagiousness: the highlights.

Total laryngectomy patient in COVID-19 pandemics	
Fragilities	Contagiousness
The definitive tracheostomy represents an element of fragility, as the nasal filter is missing	Isolation of the elderly laryngectomised patient may be difficult to be managed at home
The average age of laryngectomized patients is at greatest risk of developing serious complications in case of SARS-CoV-2 infection, due to their comorbidities	The tracheostomy generates a greater aerosol load in comparison to normal respiration through the upper airway
The pulmonary status of laryngectomised patients is often already compromised due to smoking-related chronic pulmonary disease	The aerosolisation of tracheal secretions leads to a high risk of transmitting viral droplets to members of the community
The state of immunodeficiency, possibly related to the need for adjuvant chemotherapy, is a risk factor for developing serious complications from COVID-19	The high viral load present in the upper aerodigestive tract determines a high transmission hazard for the physician and health care staff
Hospitalisation in the medical area in case of nosocomial infection can lead to difficulties in postoperative management and rehabilitation	The frequent manipulation of the tracheostoma leads to a higher risk of contact transmission
Greater difficulties may arise in pulmonary rehabilitation of the laryngectomised patient, after COVID-19 pneumonia	The use of HMEs and covers over the stoma can help limit exposure and transmission risk related to this patient population

nasal mucosa was sampled in most cases. All the patients tested with nasal swabs alone reported that tracheostomal swabs were not mentioned in the guidelines adopted at their hospital. For the 5 TL patients who tested positive for SARS-CoV-2, diagnosis was established on a nasal swab in 4 cases, while three developed specific COVID-19 symptoms. This might reasonably mean that nasal swabs are not inappropriate in the TL patient. There is some evidence in the literature to suggest that, although the upper airways are functionally separate from the lungs after TL, the finding of SARS-CoV-2 in nasopharyngeal swabs could indicate haematogenous dissemination from a primary lung infection<sup>11</sup>. On the other hand, in our patient who developed COVID-19, diagnosis was obtained by testing bronchial aspirates, while a nasal swab was negative. This would point to the main viral load primarily affecting the lungs via the stoma.

There are published studies demonstrating that the two receptors required for SARS-CoV-2 infection are co-expressed in type II pneumocytes, ileal enterocytes and nasal epithelial cells<sup>12</sup>. The type of local immune response in the nasal mucosa may drive the systemic cytokine response, and the priming of lung immunity<sup>13,14</sup>. On the other hand, as the primary respiratory flow in TL patients is via their stoma, the trachea and lungs would be additional sites of direct inoculation. During the severe acute respiratory syndrome (SARS) outbreak of 2003, high concentrations of viral RNA were detected in intratracheal aspirates, indicating that the virus can also replicate in tracheal secretions<sup>15</sup>. For TL patients it is therefore important to consider testing for SARS-CoV-2 in tracheal aspirates as well as in the nasal cavities<sup>7</sup>.

In suspected cases of COVID-19 with negative nasal swabs, samples of sputum, endotracheal aspirates and bronchoalveolar lavage should be collected and sent directly to the microbiology laboratory for processing, as they may reveal the virus with a greater sensitivity than upper respiratory tract specimens<sup>16</sup>.

In responding to our telephone questionnaire, 84 of the patients in our sample reported using the HME every day. Unfortunately, only 4 patients had obtained a specific antiviral filter. To minimise the spread of aerosolised particles to and from TL patients, their tracheostoma should be covered with an HME, preferably with integrated viral/bacterial hydroscopic filters<sup>17</sup>. These devices, available from many commercial suppliers, are effective in reducing the incidence of tracheobronchial infections in TL patients<sup>18</sup>. A physical barrier over the stoma, such as a surgical mask, scarf, or shirt could also be considered. However, 6 patients (6.5%) reported being unaware of the importance of protecting the stoma, which indicates that they had been inadequately informed by healthcare staff.

When we examined SARS-CoV-2 tests performed in our sample of TL patients, only 25 patients (27%) were tested,

and 5 (20%) were positive. Most of our patients reported having been very cautious during the COVID-19 pandemic. They avoided crowded places and did not meet people from outside the family. This behaviour was prompted partly by their having undergone TL, but was mainly due to the awareness of belonging to the age group at highest risk of serious consequences if they contracted the infection.

All the patients in our sample reported being rather anxious about the risk of contagion when attending hospital facilities. Their concern is justified by evidence in the literature of the risk of infection being higher in hospital environments than in the community<sup>19</sup>. Those of our patients who reported feeling at higher risk of contracting COVID-19 (52%) had been advised by their family to take special precautions. This evidence would suggest a role for family members in contributing to their anxiety. On the other hand, all the patients who complained of having difficulty managing their stoma (13%) said the problems were mainly related to delays in arranging travel to our hospital facility due to the lockdown.

Several authors agree in spreading the following rules to protect laryngectomees from contagion<sup>20</sup>:

- to be wearing an HME, especially when around other people;
- protect the stoma with a filter and prevent direct contact of fingers to the tracheostoma<sup>21</sup>. Moreover, there are commercially available specific antiviral filters that allow a filtration rate > 99.9%, also suitable for COVID-19 positive laryngectomies<sup>22</sup>;
- for people using trachea-oesophageal speech, hands-free HME is available; such a device does not require touching while speaking. When it is not available, use a non-dominant hand for stoma occlusion<sup>23</sup>;
- to be wearing a surgical mask (preferably an N95 respirator) over the stoma and an additional surgical mask or respirator over the nose and mouth, along with protective glasses or a face guard;
- wash hands often with soap and water for at least 20 seconds. Use an alcohol-based hand sanitiser that contains at least 60% alcohol if soap and water are not available. This is especially important before managing the stoma and touching the HME when using trachea-oesophageal speech<sup>24</sup>.

## Conclusions

The COVID-19 pandemic has posed significant problems for TL patients. It is important to ensure they always receive adequate information from healthcare staff about the management of their stoma in this situation. Specific guidelines are also needed for testing TL patients for SARS-CoV-2.

### *Conflict of interest statement*

The authors declare no conflict of interest.

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### Authors' contributions

AB, FB, FC and MB: study concept, supervision and revision; ML and VdR: study concept, questionnaire administration, data collection and processing, drafting of the manuscript.

### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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